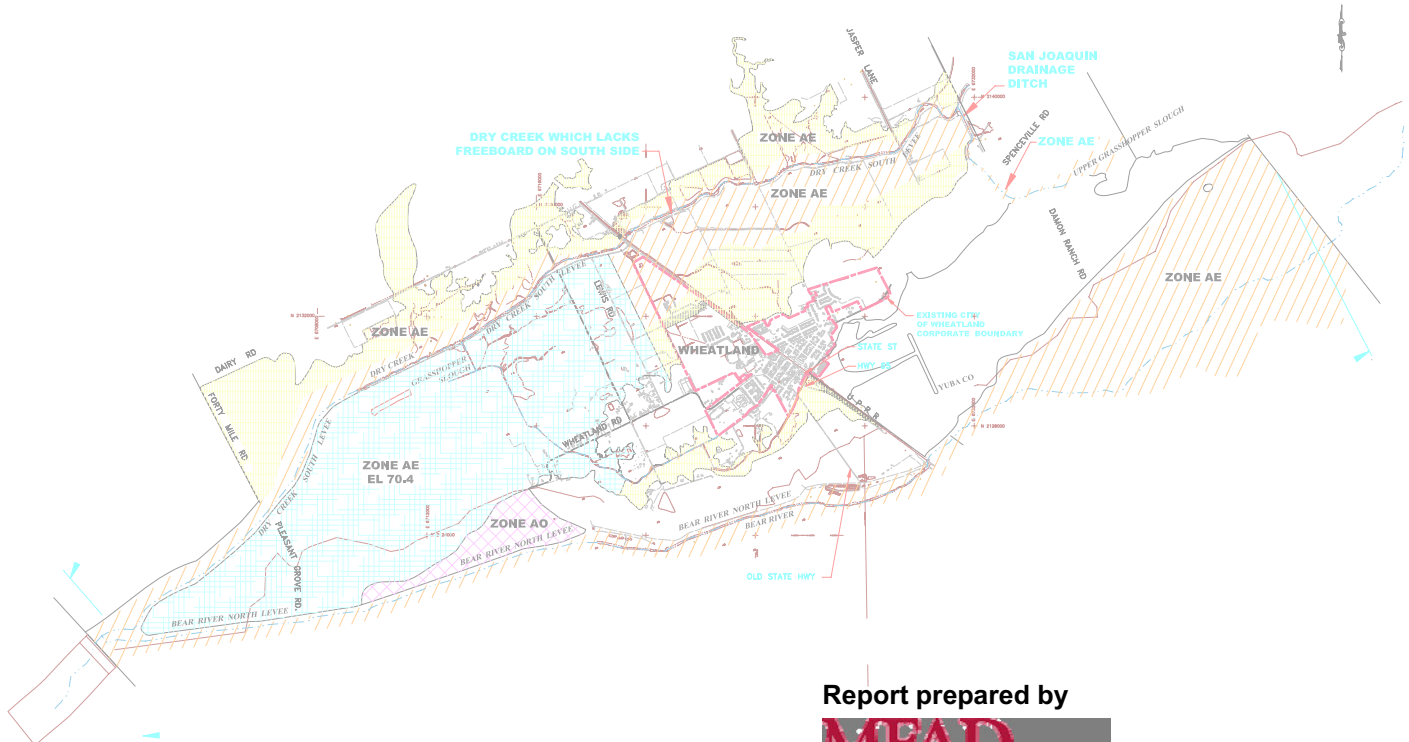




External Source Flood Protection Plan

Draft October 20, 2005

City of Wheatland
General Plan Update



Report prepared by



www.meadhunt.com

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Executive Summary Table

Table 1 provides a summary of the flood protection options for the Wheatland area.

Table 1. Summary of Flood Mitigation Options

Flood Control Measure	Description	Area Protected	Considerations	Estimated Cost Range
<i>Flood Control Alternatives for the General Plan Area</i>				
Alternative 1 – Oakley Lane Cross Levee	Construct a cross levee between north Bear River levee and the south Dry Creek levee adjacent to Oakley Lane and improvements to the existing Dry Creek south levee and San Joaquin Drainage Ditch west levee.	General Plan Area 1,955 acres are protected.	Pros: <ul style="list-style-type: none"> Lowest Cost Alternative FEMA Certifiable Flood Protection Minimize Internal Drainage Cons: <ul style="list-style-type: none"> No flood control improvements west of cross levee Disruption to farming Right-of-way issues 	\$8.5 mil – \$20.8 mil \$4,343/ac – \$10,611/ac
Alternative 2 – Pleasant Grove Road Cross Levee	Construct a cross levee between the north Bear River levee and the south Dry Creek levee, parallel to and just east of Pleasant Grove/Forty Mile Road and improvements to the existing Dry Creek south levee, San Joaquin Drainage Ditch west levee, and downstream section of the north Bear River levee.	General Plan Area plus area between the Alternative 1 Oakley Lane Cross Levee and the proposed Pleasant Grove Road Cross Levee 3,579 acres are protected.	Pros: <ul style="list-style-type: none"> Increased flood protection Minimize cross-levee right-of-way Avoids high environmental mitigation costs Cons: <ul style="list-style-type: none"> Interior drainage Higher cost Highways issue 	\$14.8 mil – \$35.0 mil \$4,133/ac – \$9,774/ac
Alternative 3 – No Cross Levee	10.1 miles of existing perimeter levees improvements with no cross levee	All of the area bounded on the south by the Bear River and the North by Dry Creek 3,846 acres are protected.	Pros: <ul style="list-style-type: none"> Maximum flood protection Cons: <ul style="list-style-type: none"> High cost Issues with existing levees near confluence High environmental mitigation for land gained 	\$30.8 mil – \$54.3 mil \$8,011/ac - \$14,115/ac
<i>Flood Control Option North of Dry Creek</i>				
Flood Control Levee North of Dry Creek	Provide a levee to protect existing homes and the proposed development within the GPU north of Dry Creek	Areas north of Dry Creek 214 acres are protected.	Pros: <ul style="list-style-type: none"> Leaves residents north of Dry Creek whole after construction of flood mitigation measure above. Cons: <ul style="list-style-type: none"> Additional internal drainage and access requirements. 	\$1.8 mil - \$2.7 mil \$8,341/ac - \$12,514/ac

1. Introduction

The City of Wheatland is experiencing an unprecedented population growth that is anticipated to continue in the foreseeable future. In order to provide a current basis for evaluating future growth on both public and private lands the Wheatland City Council made the decision to update the 1980 General Plan.

As part of the General Plan Update, this report was prepared to serve as a planning tool for the City to evaluate flooding from external sources in the city of Wheatland and surrounding areas. The city of Wheatland and surrounding areas are bounded by the Bear River to the south, San Joaquin Drainage Ditch to the east, and Dry Creek to the north, as shown on Figure 1. A selection of alternative measures with a range of impacts and associated costs to mitigate for the future flooding potential was evaluated. This report is intended to be utilized by the City in the GPU process, the actual development, implementation, and maintenance of flood protection for the City is the responsibility of the Reclamation Districts.

Three alternative measures are evaluated to mitigate flooding potential from the Bear River, Dry Creek, and the San Joaquin Drainage Ditch with the intent of capturing the range of potential mitigation options for flooding from external sources. Alternatives 1 and 2 incorporate cross levees with positions selected to represent the range of locations that the cross levees could be located; Alternative 1 representing the furthest east and Alternative 2 representing the furthest west. The cross levees were developed as cost effective alternatives to protect the area within the GPU limits. This cost effectiveness is realized by avoiding the expense of improving the existing north Bear River and south Dry Creek levees downstream from the selected position of the cross levee. Alternative 3 does not incorporate a cross levee and requires improvements of essentially all of the existing levees bounding the city of Wheatland and the surrounding area. The flood control alternatives for the General Plan Area include:

- Alternative 1 – Oakley Lane Cross Levee
- Alternative 2 – Pleasant Grove Road Cross Levee
- Alternative 3 – No Cross Levee

In addition to the three alternative measures listed above, the option to provide additional flood protection for existing homes and planned development within the GPU to the north of Dry Creek is evaluated to demonstrate the ability to provide flood protection equal to that which exists for these areas and to that to be provided to the General Plan Area.

The evaluations included a hydraulic analysis of the major conveyance features (the Bear River, Dry Creek, and the San Joaquin Drainage Ditch) to determine the impacts to the floodplains and channel hydraulics for each alternative and determine the design parameters for levee improvements or new levee construction. This report describes each alternative, discusses the implications for the mitigation alternatives, and provides a range conceptual-level cost estimates. The evaluations also considered environmental impacts for construction of the alternatives and provides a preliminary assessment of the permitting and approval process required.

Further evaluations consider the timing of the improvements. There is a benefit to implementing a phased construction approach to provide incremental flood protection as discussed later in this report.

2. Description of Flooding

There are two types of drainage systems that affect the city of Wheatland – those related to internal drainage and those related to flooding from external sources. This report focuses on flooding from external sources, management of internal drainage issues are being addressed in a separate report. The systems, jurisdictions, and current status of the existing flood control system are described below.

A. Flood Control Systems

Flood control systems are typically designed to provide protection against 25-year to 200-year flood events. Examples of these facilities are dams, levees, drainage channels, and pump stations. Flood control for the City of Wheatland General Plan Area is provided by a series of levees. These levees are intended to protect the city of Wheatland and adjacent areas (this is the study area as defined in the General Plan) from the following sources of flooding (see Figure 1):

- North Bear River Levee – Located south of the study area with flows from east to west
- South Dry Creek Levee – Located north of the study area with flows from east to west
- West San Joaquin Drainage Canal Levee – Located east of the study area with flows from south to north and into Dry Creek northeast of study area

The existing levee system does not provide an adequate level of flood protection for development around the city of Wheatland and adjacent areas including development in the General Plan Preferred Land Use alternative. As such, much of the area around the study area is located in a Federal Emergency Management Agency (FEMA) flood zone. Improvements to the levee system are necessary for future development.

B. Jurisdiction

The Reclamation District 2103 is responsible for maintenance and operation of the Dry Creek levees, Bear River levee, and the San Joaquin drainage canal that are in the closest proximity to the City and General Plan Area. These three channels are outside of the existing city limits, but are within the area of interest. Reclamation District 817 is responsible for maintenance and operation of the western portions of the Dry Creek and Bear River levees. Levee jurisdiction for these two Reclamation Districts is shown in Figure 1.

In addition to Yuba County, portions of the Bear River levee system east of Highway 65 are located in Placer County and west of Highway 65 are located in Sutter County.

The levee systems are under the jurisdiction of each Reclamation District in which the levee or portion of the levee is located. Any improvements to the levee systems or other types of improvements to remove areas from the floodplain are the responsibility of the Reclamation Districts and will require an adequate comprehensive financing system to provide system maintenance to FEMA required standards.

C. FEMA 100-Year Floodplain Zoning

Figure 1 also shows the 100-year floodplains and the existing condition of the levees bounding the city of Wheatland and study area as presently defined by the FEMA pending certification for the 100-year flood. The FEMA 100-year floodplains are important because they provide the elevations to establish whether an area is in or out of a floodplain and determines the applicable insurance rates. Based on the proposed floodplain Letter of Map Revision (LOMR) submitted to FEMA for Reclamation District 2103 and adjacent area, a substantial portion of the northern area within the existing study area is within a FEMA floodplain as well as areas west and east of the city limits.

Developers, utilities, or municipalities can submit an application for a Conditional Letter of Map Revision (CLOMR) or a LOMR. For a CLOMR, FEMA will provide a “letter from FEMA commenting on whether a proposed project, if built as proposed, would meet minimum National Flood Insurance Program Standards.” For a LOMR, FEMA will provide “a letter from FEMA officially revising the current National Flood Insurance Program map to show changes to floodplains, floodways on flood elevations.”

Areas outside of the FEMA “effective” 100-year floodplain can be developed following the normal City of Wheatland or County standards. In order to develop within the “effective” floodplain, the area to be developed must be protected by flood control facilities to safely handle a 100-year event. Prior to start of construction, the developer can submit an application for a CLOMR. The CLOMR can be prepared and submitted during the planning and design period. This provides FEMA a chance to uncover problem areas that need to be addressed before FEMA will approve the start of construction. Since most of the required information is submitted prior to construction, the follow-up application for a LOMR only needs to describe significant changes to the proposed plan and submit as-built drawings to complete the process and receive approval.

D. Current Status

The current FEMA floodplain map is Community Panel No. 060460A, adopted on September 29, 1986. The map is an outdated map that provides only an approximation of the flooding – not based on hydrologic and hydraulic studies. As such, the map does not include floodplain elevation information and is in need of substantial revision.

From 1998 to 2002, Reclamation District 2103 prepared plans for and improved the Bear River levee from east of Highway 65 near the San Joaquin canal to approximately 13,000 feet west of SR65. Because of these changes, Reclamation District 2103 sponsored a study to certify the rehabilitated Bear River north levee and improve the definition of the floodplains under existing conditions. Based on better topographic information and hydrologic and hydraulic analyses, an application was prepared requesting a LOMR for the Reclamation District 2103 and adjacent areas. FEMA requires the floodplain mapping to reflect existing 100-year flooding conditions. At the time that this report was prepared the LOMR was pending. Figure 1 reflects the floodplain based on the pending LOMR.

Only the upper reach of the Bear River north levee is included in the LOMR application (see Figure 1). The lower portion of the Bear River north levee from approximately 13,000 feet west of Highway 65 to the confluence with Dry Creek, the Dry Creek south levee, and the San Joaquin Drainage Ditch levees are not deemed to be currently FEMA certifiable. As such, these reaches of levee bounding the city of Wheatland and General Plan Area must be considered to fail in a 100-year flood event as defined by FEMA.

At the time this report was prepared Reclamation District 2103 has authorized additional geotechnical investigations to assess under seepage on the improved levee section. These investigations were required by the U.S. Army Corps of Engineers (USACE) to meet criteria for levee certification. When these investigations and under seepage evaluations are complete they will be submitted to the USACE for their review. If the USACE is satisfied that criteria is met for certification of the levee section FEMA will review the basis of certification and concur or disagree with the findings. There is the potential that remedial work will be required on the rehabilitated section of the Bear River north levee after the additional geotechnical investigative work is completed.

Since the submission of the LOMR for the upper reach of the Bear River north levee the California Department of Water Resources (DWR) has issued a report entitled, "Lower Feather River Floodplain Mapping Study," prepared by the USACE, Sacramento District, revised February 17, 2005. This report contains some differences in the hydrology and hydraulics from that used in the LOMR. The water surface profiles and flow rates for the DWR 100-year and 500-year events on the Bear River and Dry Creek are shown on the profiles included in Appendix B. The flood control systems developed for this report are based on the 100-year event as defined in the LOMR also shown on the profiles in Appendix B.

3. Levee Improvement Alternatives

To mitigate for the flooding issues associated with the City of Wheatland and the General Plan Area, three alternative flood control systems, all consisting of levee improvements, were developed and evaluated. These alternatives were developed with the objective to protect the Preferred Land Use Alternative approved by the General Plan Steering Committee on April 7, 2005, from external sources of flooding described above in accordance with FEMA standards. The alternatives are:

- Alternative 1 – Oakley Lane Cross Levee
- Alternative 2 – Pleasant Grove Road Cross Levee
- Alternative 3 – No Cross Levee

There are several common features associated with all three of the alternatives that are not discussed individually in the description or consideration of the three alternatives. These common considerations include:

- Construction of all three of the proposed alternatives will require the submittal of a LOMR request to FEMA for levee certification and appropriate zoning to allow development.
- All three of the alternatives include the reconstruction of at least the upstream 4.4 mile section of the south Dry Creek Levee and 1,000 feet of the west San Joaquin Drainage Ditch levee. This levee construction will have a base amount of mitigation for disturbance of riparian habitat associated with the levee widening. The cost for this mitigation is considered in all of the cost estimates.
- None of the proposed alternatives identified any downstream impacts.
- Clearing of vegetation from the channel was not evaluated as a flood control measure.

Conceptual-level costs were developed for the three proposed levee improvement alternatives. The estimates presented are intended to be relative to each other and to provide a basis of alternative evaluation within the GPU process and are not intended to be the actual cost estimates to be used. The scope of the levee improvements is not expected to extend further upstream from the areas studied. In addition to the proposed levee improvements, estimates of flood protection for the planned development within the GPU north of Dry Creek and the option of providing flood control for existing homes north of Dry Creek are included. The costs for the flood mitigation option north of Dry Creek are constant and are additive to the costs for the three levee improvement alternatives. The acres of land removed from the floodplain as a result of each alternative are presented in Appendix A along with the calculation of cost per acre.

The specific requirements for the three selected alternatives are discussed below.

A. Alternative 1 – Oakley Lane Cross Levee

Alternative 1, construction of the Oakley Lane Cross Levee and associated existing levee improvements along Dry Creek and the San Joaquin Drainage Ditch, is presented in Figure 2.

(1) Alternative Description

The Oakley Lane Cross Levee Alternative includes construction of a cross levee between the downstream end of the rehabilitated section of the north Bear River levee and the south Dry Creek levee along the shortest route between the two levees and improvements to the existing Dry Creek south levee and San Joaquin Drainage Ditch west levee. The resulting cross levee will be located approximately 3,000 feet west of and parallel to Oakley Lane, in a generally north-south direction. The location of the south end of the levee was selected based on the pending LOMR, using the full extent of the rehabilitated reach of the north Bear River levee.

The crest of the new Oakley Lane Cross Levee will be at a minimum elevation of 73.4. The crest elevation was developed using hydraulic models for the Bear River and simulating a failure of the lower portion of the north Bear River levee (downstream from the portion of the levee included in the pending LOMR) during the 100-year flood, in accordance with FEMA guidelines for a non-FEMA-certifiable levee. Results from the hydraulic analysis were used to establish the levee height at three feet above the backwater from the Bear River Levee failure for the 100-year flood, in accordance with FEMA guidelines. Final design of the levees on the south side of Dry Creek and north side of the Bear River may result in the cross levee being higher than 73.4.

The maximum height of the cross levee will be approximately 14.5 feet¹ above existing grade and the south end of the cross levee ties into high ground at contour elevation 73.4. The cross levee will be approximately 6,700 feet long with a 20-foot crest width, a 3 horizontal to 1 vertical upstream (or west) side slope, and a 2 horizontal to 1 vertical downstream (or east) side slope. Approximately 18 acres of right-of-way will be required to build and maintain the levee.

In addition to construction of the Oakley Lane Cross Levee, improvements to existing levees are also required for this alternative to meet FEMA standards. Approximately 4.4 miles of the south Dry Creek levee from the point of intersection of the cross levee upstream to the San Joaquin Drainage Ditch and approximately 1,000 feet of the west San Joaquin Drainage Ditch levee need to be reconstructed, raised, and widened to provide the required 100-year freeboard and acceptable stability. Approximately 48 acres of additional right-of-way will be required to build and maintain the reconstructed levee. Mitigation will be required for approximately 42 acres of riparian habitat (river-side habitat adjacent to the levee that will be disturbed by the levee construction).

(2) Considerations

There are several considerations, both pros and cons, associated with the Oakley Lane Cross-Levee Alternative. Those considerations include:

¹ The proposed levee cross-section dimensions presented throughout this report are based on typical levee designs and, as such, dimensions presented herein are approximate.

Pros:

- **Lowest Cost Alternative** – This alternative has the lowest cost of the three alternatives evaluated to protect the General Plan Area.
- **FEMA Certifiable Flood Protection** – This alternative meets the base objective of the evaluation to protect the General Plan Area.
- **Minimize internal drainage** – There will be internal drainage issues associated with all three of the alternatives to address flooding and drainage resulting from rainfall within the protected areas. This alternative will minimize the cost to address internal drainage issues as it protects the smallest area.

Cons

- **High cost for future development outside the protected area** – This alternative does not provide any flood protection for the areas located to the west of the Oakley Lane Cross Levee.
- **Disruption to farming** – Construction of the Oakley Lane Cross Levee will be disruptive to farming outside the General Plan Area.
- **Right-of-way** – Construction of the Oakley Lane Cross-Levee will require the purchase of 18 acres of new right-of-way that will likely be controversial and may require eminent domain to purchase. Right-of-way issues associated with the reconstruction of the south Dry Creek levee and west San Joaquin drainage ditch levee are not considered as a unique con as they are required for all three alternatives.

(3) Cost Estimate

Table 2 shows the conceptual-level cost estimate developed for completion of the Oakley Lane Cross Levee flood mitigation project².

² The cost estimates presented in this report were developed as conceptual-level cost estimates and include estimates for earthwork, environmental mitigation, and additional right-of-way/land acquisition associated with the alternatives based on typical costs experienced by Mead & Hunt engineers on projects of similar magnitude. It should be noted that detailed studies to determine the actual amount to implement the flood control alternatives were not within the scope of this study. The purpose of the cost estimates presented in this report is to provide order-of-magnitude cost estimates for the sole purpose of providing a planning tool to be used for the City's General Plan Update process.

**Table 2. Alternative 1 – Oakley Lane Cross Levee
Conceptual Level Cost Estimate**

Item	Range of Costs
Cross Levee	\$1.6 mil – \$4.5 mil
Dry Creek and San Joaquin Drainage Ditch Levee Raising and Widening	\$6.8 mil – \$16.2 mil
Total	\$8.5 mil - \$20.7 mil

B. Alternative No. 2 – Pleasant Grove Road Cross Levee

Alternative 2, construction of the Pleasant Grove Cross Levee and associated existing levee improvements along Dry Creek, Bear River, and the San Joaquin Drainage Ditch, is presented in Figure 3.

(1) Alternative Description

The Pleasant Grove Road Cross Levee Alternative includes construction of a cross levee between the north Bear River levee and the south Dry Creek levee, parallel to and just east of Pleasant Grove/Forty Mile Road and improvements to the existing Dry Creek south levee, San Joaquin Drainage Ditch west levee, and downstream section of the north Bear River levee.

The crest of the cross levee will be at a maximum elevation 76.0, which is three feet above the Bear River 100-year water surface profile with no levee failure. The cross levee will slope from elevation 76.0 at the north Bear River levee to elevation 72.0 at the south Dry Creek levee. Final design of the levees on the south side of Dry Creek and north side of the Bear River may result in the cross levee being at higher elevations. The Bear River hydraulic model was used to establish the 100-year flood elevations at the cross levee location. In that analysis it was assumed that the downstream section of the north Bear River levee that is currently not FEMA certifiable will be reconstructed and certified and, as such, be able to contain the 100-year flood.

The maximum height of the cross levee is approximately 16.5 feet above existing grade. The cross levee will be approximately 3,800 feet long, with a crest width of 20 feet, a 3 horizontal to 1 vertical upstream (or west) side slope, a 2 horizontal to 1 vertical downstream (or east) side slope, and a ten foot bench between the cross levee and road embankment. Approximately 10 acres of right-of-way will be required to build and maintain the levee.

In addition to construction of the Pleasant Grove Road Cross Levee, improvements to existing levees are also required for this alternative to meet FEMA standards. Improvements will consist of reconstructing, raising, and widening the levee to provide the required 100-year freeboard and stability. The improvements include the following levees:

- Approximately 2.1 miles of the north Bear River levee, between the cross levee and the downstream end of the FEMA certifiable reach of the north Bear River levee;
- approximately 6.0 miles of the south Dry Creek levee, from the point of intersection of the Pleasant Grove Road Cross Levee upstream to the San Joaquin Drainage Ditch; and
- approximately 1,000 feet of the west San Joaquin Drainage Ditch levee.

Approximately 94 acres of additional right-of-way will be required to build and maintain the reconstructed levees. Mitigation will be required for approximately 84 acres of riparian habitat.

(2) Considerations

There are several considerations, both pros and cons, associated with the Pleasant Grove Road Cross-Levee Alternative. Those considerations include:

Pros:

- **Increased flood protection** – This alternative provides protection for the vast amount of the area downstream of the alternative Oakley Lane Cross Levee to the confluence of Dry Creek and the Bear River. This is a considerably greater area of flood protection than that covering only the General Plan Area.
- **Cross levee right-of-way** – The Pleasant Grove Road Cross Levee requires 10 acres of right-of-way as opposed to the approximately 18 acres necessary to construct the Oakley Lane Cross Levee, and as such should be significantly less disruptive to farming.
- **Environmental mitigation** – With the proposed cross levee location, the most dense populations of elderberry bushes, west of Pleasant Grove Road on both the Bear River and Dry Creek, can be left undisturbed.

Cons:

- **Interior drainage** – Since the protected area by the levees is larger than for Alternative 1, which locates the cross levee at Oakley Lane, mitigation to deal with Interior drainage issues will likely be more costly.
- **Construction cost** – The construction cost for this alternative is considerably higher than that for Alternative 1 which locates the cross-levee 3,000 feet west of Oakley Lane.
- **Highway issues** – This alternative is constructed adjacent to a county road and will require additional coordination with the Yuba County Public Works Department to assure public safety.

(3) Cost Estimate

Table 3 shows the conceptual-level cost estimate developed for completion of the Pleasant Grove Road Cross Levee flood mitigation project alternative.

**Table 3. Alternative 2 – Pleasant Grove Road Cross Levee
Conceptual Level Cost Estimate**

Item	Range of Costs
Cross Levee	\$1.2 mil - \$3.9 mil
Bear River Levee Raising and Widening	\$3.4 mil - \$7.3 mil
Dry Creek and San Joaquin Drainage Ditch Levee Raising and Widening	\$10.2 mil - \$23.7 mil
Total	\$14.8 mil - \$35.0 mil

C. Alternative No. 3 – No Cross Levee

Alternative 3, existing levee improvements along Dry Creek, Bear River, and the San Joaquin Drainage Ditch with no cross levee is presented in Figure 4.

(1) Alternative Description

The no cross levee alternative includes approximately 10.1 miles of existing perimeter levees improvements with no cross levee. Improvements to the existing levees that are not currently FEMA certifiable are required for this alternative to meet FEMA standards. Improvements will consist of reconstructing, raising, and widening the levee to provide the required 100-year freeboard and stability. The improvements include the following levees:

- The north Bear River levee from the downstream point of the rehabilitated section of the levee and extending to the confluence of Dry Creek;
- The south Dry Creek levee from the confluence of Bear River upstream to the San Joaquin drainage ditch; and
- The west San Joaquin drainage ditch levee.

All of the levee improvements were evaluated with the hydraulic models, using the resulting 100-year flood elevations plus three feet to establish top of levee elevations. Approximately 125 acres of additional right-of-way will be required to build and maintain the reconstructed levees. Mitigation will be required for approximately 84 acres of riparian habitat and for relocation of approximately 250 elderberry bushes.

(2) Considerations

There are several considerations, both pros and cons, associated with the No Cross Levee alternative:

Pros:

- **Maximum flood protection** – This alternative provides the maximum amount of flood protection possible within the boundaries of the three major drainage features surrounding the city of Wheatland.

Cons:

- **Cost** – Costs for this alternative are the highest of all of three alternatives. The higher costs are primarily associated with the relocation of the extensive growth of Elderberries below Forty Mile/Pleasant Valley Road and required mitigation.
- **Issues with existing levees near confluence** – Relative to the protection of the limited acreage west of the Forty Mile /Pleasant Valley Road, and the confluence of the Bear River and Dry Creek Levees, there is a high probable cost for construction and environmental mitigation.
- **High environmental mitigation for land gained** – The incremental land gained over Alternative 2 has a high population of elderberry bushes, which require very costly mitigation and drive the project cost way up.

(3) Cost Estimate

Table 4 shows the conceptual-level cost estimate developed for completion of the No Cross Levee flood mitigation project alternative.

**Table 4. Alternative 3 – No Cross Levee
Conceptual Level Cost Estimate**

Item	Range of Costs
Bear River Levee Raising and Widening	\$16.3 mil - \$23.6 mil
Dry Creek and San Joaquin Drainage Ditch Levee Raising and Widening	\$14.5 mil - \$30.6 mil
Total	\$30.8 mil - \$54.3 mil

4. Flood Protection Option North of Dry Creek

Modifications to the requirements for flood control have been identified to protect existing homes and the proposed development north of Dry Creek. This area is addressed separately from the three alternatives for the General Plan Area as none of these areas would be protected by any of those three alternatives.

A. Flood Mitigation Project Description

The proposed new development on the north side of Dry Creek will be protected by local levees that comply with FEMA requirements. However, some of the existing housing on the north side of Dry Creek will be impacted by 200- to 500-year events. Flood protection for the effected housing can be provided by relatively low local levees that would provide an equal level of protection as the land on the south side of Dry Creek. Fill to raise the area one foot above the 100-year water surface was compared with establishing a levee around the areas to be protected. It was found that substantially more material would be required to fill the entire area when compared with constructing a levee. It is therefore proposed to provide levee protection, internal drainage, and related access across the levees. The layout of these levees is shown in Figure 5

B. Considerations

The existing homes could also be dealt with by flood easements versus providing levee protection.

C. Cost Estimate

Table 5 shows the conceptual-level cost estimate developed for completion of the Flood Protection Option North of Dry Creek.

**Table 5. Flood Protection Option North of Dry Creek
Cost Estimate**

Item	Range of Costs
Levee for Planned Development	\$0.9 mil - \$1.4 mil
Levee for Existing Houses	\$0.9 mil - \$1.3 mil
Total	\$1.8 mil - \$2.7 mil

5. Environmental Considerations

The three flood control alternatives each provide equivalent flood protection for the preferred land use alternative. In addition to the variation of costs for the three alternatives discussed above, the environmental impact of the three levee improvement alternatives varies significantly. Table 6 summarizes the lengths of existing levees that are impacted by each alternative. The significance of this information is to evaluate the amount of riparian habitat that will be disturbed and ultimately require mitigation associated with raising, widening, and reconstructing existing levees.

Table 6. Length of Existing Levee Impacted by Each Alternative

Levee Alternative	North Bear River Levee	South Dry Creek Levee	Total
No. 1	N/A	4.0 miles	4.0 miles
No. 2	2.1 miles	6.0 miles	8.1 miles
No. 3	3.1 miles	7.0 miles	10.1 miles

In addition to the variation of length of the levees impacted it is also significant to note that the reaches of Bear River and Dry Creek below Forty Mile/Pleasant Grove Road have high populations of elderberry bushes that will be extremely expensive to relocate/mitigate. These reaches are only affected by Alternative No. 3. A recent levee repair project on the Feather River in south Yuba County involved relocation of 43 elderberry bushes at a cost of \$1.9 million, or about \$44,000, per bush.

6. Permitting and Approvals

The permitting requirements further described below are the same for all three alternatives, even though the levee configurations, impacts, and required mitigation will likely differ. For example, high populations of elderberry bushes, habitat to the federally threatened valley elderberry longhorn beetle, exist along the reaches of Bear River and Dry Creek downstream of Forty Mile and Pleasant Grove Roads. This area would be heavily impacted under Alternative 3 and would likely require significant mitigation that may not be required under the other two alternatives. However, all three alternatives will require consultation with the U.S. Fish and Wildlife Service and the National Marine Fisheries Service under Section 7 of the Endangered Species Act to determine the extent to which each levee configuration alternative may impact federally threatened or endangered species.

A. Federal

National Environmental Policy Act (NEPA) Review – This project is subject to NEPA review because it includes a federal action that may have a significant effect on the environment.

Federal Emergency Management Agency (FEMA) Letter of Map Revision (LOMR) – The three project alternatives seek to construct and/or rehabilitate flood control levees around the city of Wheatland, which may affect the FEMA flood hazard designation of the area. Thus, a LOMR is required to officially change the Special Flood Hazard Area boundary. This must USACE current requirements related to levee stability.

Section 404 Permit U.S. Army Corps of Engineers – Levee work in the riparian zone would require approval from the USACE under Section 404 of the Clean Water Act, since the work may involve intentional or unintentional placement of fill or discharge of dredged materials into "waters of the United States," namely, Bear River and/or Dry Creek. This permit applies even if there is a chance that winter rains may cause erosion leading to sediment discharges into the "waters."

Consultation under Section 7 of the Endangered Species Act with U.S. Fish and Wildlife Service (USFWS) and with National Marine Fisheries Service – The Fish and Wildlife Coordination Act requires that all Federal agencies consult with the USFWS, the National Marine Fisheries Service and State wildlife agencies (i.e., the California Department of Fish and Game) for activities that affect, control, or modify waters of any stream or bodies of water. In addition, the USFWS functions in an advisory capacity to the USACE under the provisions of the Fish and Wildlife Coordination Act and other legislation. This flood control project is of interest to USFWS and National Marine Fisheries Service since it may affect federally listed threatened or endangered species such as the Valley elderberry longhorn beetle or marine fish and related habitat within Bear River or Dry Creek.

B. State

California Environmental Quality Act (CEQA) Review – CEQA review applies to any activity undertaken which requires a discretionary state governmental approval and may cause either a direct physical change in the environment or a reasonably foreseeable indirect change in the environment, unless an exemption applies. This levee rehabilitation project requires approval from the Reclamation Board and thus is subject to CEQA review.

Floodplain Encroachment Permit from the Reclamation Board – The Reclamation Board's jurisdiction includes the entire Central Valley, including all tributaries and distributaries of the Sacramento and San Joaquin Rivers and Tulare and Buena Vista basins. This permit is required for any proposed work, including the placement, construction, reconstruction, removal, or abandonment of any landscaping, culvert, bridge, conduit, fence, projection, fill, embankment, building, structure, obstruction, encroachment or works of any kind, and including the planting, excavation, or removal of vegetation, and any repair or maintenance that involves cutting into the levee, wholly or in part within any area for which there is an adopted plan of flood control. All three alternatives include levee construction and rehabilitation, which require a Floodplain Encroachment Permit.

Central Valley Regional Water Quality Control Board Section 401 Water Quality Certification – This certificate is required for any activity which may result in a discharge into any waters in the United States, including flood control channelization, channel clearing, and placement of fill. Likewise, Section 401 of the Federal Clean Water Act requires that every applicant for a USACE CWA Section 404 permit must request state certification from the Regional Board. Levee work under all three alternatives is subject to the USACE CWA Section 404 permit, and thus would require a Section 401 Water Quality Certification.

Streambed Alteration Agreement from the California Department of Fish and Game (CDFG) – This is a contract between the applicant and the CDFG stating what can be done in the riparian zone and stream course. This project would require a Streambed Alteration Agreement since the levee construction and rehabilitation work for all three alternatives will likely affect Bear River and/or Dry Creek or their associated riparian areas.

C. County

Yuba, Sutter, and Placer County Approvals – Portions of the project are located within Yuba, Sutter, and Placer Counties. Thus, construction and rehabilitation of the levees may require county approvals related to design and flood control. Likewise, if county roads are affected the project could require encroachment permits from the County's Department of Public Works.

D. Local

Reclamation Districts 817 and 2103 Approvals – Reclamation Districts 817 and 2103 have control over the facilities that provide flood control to the City and are responsible for maintenance and operation of the Dry Creek and Bear River levees that would be affected by the project. The flood control alternatives presented in this report represent the potential range of options that the Reclamation Districts will consider in the development of future facilities that provide flood control protection to the City of Wheatland and surrounding area from external sources of flooding.

City of Wheatland Review and Comment – The project affects flood control for the City of Wheatland and would thus require review and comment from the City.

7. Timing of Improvements

A. Existing Conditions

(1) Work That Can Be Performed Upon Approval of the LOMR for “Wheatland and the Adjacent Areas”

Based on the information in the LOMR for “Wheatland and the Adjacent Areas,” development is allowed in the shaded Zone X and the Zone AE floodplain by constructing foundations one foot above the designated floodplain elevations.

(2) Schedule

On September 9, 2005, we received a message from Ricardo Pinada, Director of the Floodplain Management Branch of Department of Water Resources (DWR), that the USACE had reviewed Kleinfelder’s geophysical study for the LOMR. Although the regulation was not in effect at the time of the LOMR work in October of 2003, the USACE determined that Kleinfelder’s report did not meet current USACE standards related to seepage under the levee. FEMA has determined that the report by Kleinfelder will have to be revised to comply with current USACE under seepage requirements before they will proceed with processing the LOMR. The items that need to be completed are:

- funding for the additional work by Kleinfelder;
- execution of Kleinfelder’s work regarding under seepage;
- review by the USACE; and
- complete LOMR review and approval by FEMA.

Completion of all of these activities is reasonably expected to take until spring or early summer of 2006, assuming that no remedial work to the levee section is required once the additional geotechnical investigative work is completed.

(3) Estimated Cost

The estimated cost is approximately \$120,000 for Kleinfelder’s work and continued coordination with FEMA and the stakeholders.

B. First Stage of Studied Flood Control Improvements

(1) Description of the Proposed Work

It is recommended that the first stage of improvements for flood control includes construction of the upper end of the project including the west San Joaquin Drainage Ditch levee improvements and south Dry Creek levee improvements between San Joaquin Ditch and Highway 65. Completion of this work will remove the external flooding northeast of Highway 65 with the exception of any local areas that are below elevation 70.4.

Southwest of Highway 65 the residual flooding to elevation 70.4 is a result of the FEMA mandated assumed failure of the north Bear River levee downstream of the certified section pending a LOMR. This flooding will be considered floodplain, or water that is ponded and not part of the conveyance, and not part of the floodway. Therefore, areas that are below elevation 70.4 could be filled to one foot above that elevation and developed.

(2) Schedule

The general sequence of work required prior to construction is as follows:

- Develop cost estimates for the work and award contracts
- Perform geophysical work
- Obtain topography
- Perform necessary engineering studies
- Develop final design and specifications
- Obtain the required permits as described in Section 6 – *Permitting and Approvals* of this report
- Award construction contracts and construct facilities

We estimate that completing the required studies and obtaining the necessary permits and approvals will take approximately two years. Again, this schedule assumes that no remedial work to the LOMR section of the north Bear River levee is required once the additional geotechnical investigative work by Kleinfelder is completed.

(3) Estimated Costs

These levee improvements on the south Dry Creek levee northeast of Highway 65 and the west San Joaquin Drainage Ditch levee are included in all three of the proposed alternatives. Estimated costs required for work required prior to construction are about \$300,000 to \$500,000. The range of estimated costs to implement only this portion of the proposed improvements is \$4.2 mil - \$10.3 mil and does not include the local levees north of Dry Creek.

C. Second Stage of Studied Flood Control Improvements

(1) Description of the Proposed Work

With reference to Figure 1, there are some areas southwest of Highway 65, around the city of Wheatland, that have always been above the 100-year frequency floodplain. However, before any other development can proceed down stream of Highway 65, the adopted alternative flood control measures identified in this report must be constructed.

(2) Schedule

The general sequence of work required prior to construction is as follows:

- Develop cost estimates for the work and award contracts
- Perform geophysical work
- Obtain topography
- Perform necessary engineering studies
- Develop final design and specifications
- Obtain the required permits as described in Section 6 – *Permitting and Approvals* of this report
- Award construction contracts and construct facilities

We estimate that completing the required studies and obtaining the necessary permits and approvals will take approximately three years.

(3) Estimated Cost

The estimate costs required for work required prior to construction are about \$300,000 to \$2,000,000. Estimated construction costs range from \$4.3 million to \$44 million for the remaining work, depending on the alternative selected.

D. Area North of Dry Creek

(1) Description of the Proposed Work

Construct levees north of Dry Creek to protect both existing homes and the proposed new development areas within the GPU. The section of the local levee shown on Figure 5 just west of Highway 65 would be to protect the proposed new development areas within the GPU. The sections of the levee just east of Highway 65 and at Jasper Lane could be constructed to protect the existing homes.

(2) Schedule

The general sequence of work required prior to construction is as follows:

- Develop cost estimates for the work and award contracts
- Perform geophysical work
- Obtain topography
- Perform necessary engineering studies
- Develop final design and specifications
- Obtain the required permits as described in Section 6 – *Permitting and Approvals* of this report
- Award construction contracts and construct facilities

We estimate that completing the required studies and obtaining the necessary permits and approvals will take approximately two years.

This segment of work can begin at any time.

(3) Estimated Cost

The estimated range of costs to complete this work is \$1.8 million to \$2.7 million. The estimated cost for the work prior to construction is approximately \$90,000 to \$135,000.

8. References

City of Wheatland General Plan Update, 2005.

City of Wheatland 1995 Specific Plan, May 1990

City of Wheatland Flood Control Planning Study, February 1996, prepared by Ensign & Buckley

City of Wheatland Flood Study, September 1990, prepared by Ensign & Buckley

Voumes I, II, and III, City of Wheatland and Adjacent Areas Letter of Map Revision, October 2003.

Current FEMA Standards for Preparation of CLOMR and LOMR.

FEMA Floodplain Study for the City of Wheatland, 1986.

Federal Emergency Management Agency, 44CFR, Chapter 1, Section 65.10, Mapping of Areas Protected by Levee Systems, dated October 1, 1989

Federal Emergency Management Agency, Flood Insurance Study Guidelines and Specifications for Study Contractors, page 5-3, March 1993

California State Senate, Republican Caucus, Briefing Report, Levee Maintenance, April 27, 2005.

U.S. Army Corps of Engineers, Lower Feather River Floodplain Mapping Study, Prepared for Department of Water Resources, 2005.

U.S. Department of Interior, Sacramento Fish and Wildlife Office, Conservation Guidelines for the Valley Elderberry Longhorn Beetle, Revised July 9, 1999.

U.S. Army Corps of Engineers, Sacramento River Flood Control System Evaluation, Initial Appraisal Report – Mid-Valley Area, Decemebr 1991.

U.S. Army Corps of Engineers, Flood Insurance Study of the City of Wheatland, Flood Insurance Rate Map, May 1990.

U.S. Army Corps of Engineers, Bear River Basin, California, Hydrology, Office Report, Revised 1971991.

Peak Discharge data from the U.S. Geological Survey of Dry Creek at HWY 65 and Bear River at HWY 65.

Top of Levee Profiles for Bear River and Dry Creek from the California Department of Water Resources, September 1989

Digitized Topographic Mapping of the Wheatland General Plan Area, with two foot contour intervals, prepared by Aerial Data, Inc., July 1995

Figures

- 1 Existing Flooding Conditions
- 2 Alternative 1 – Oakley Lane Cross Levee
- 3 Alternative 2 – Pleasant Grove Road Cross Levee
- 4 Alternative 3 – No Cross Levee
- 5 Flood Protection Option North of Dry Creek

Appendix A

Protected Acreage

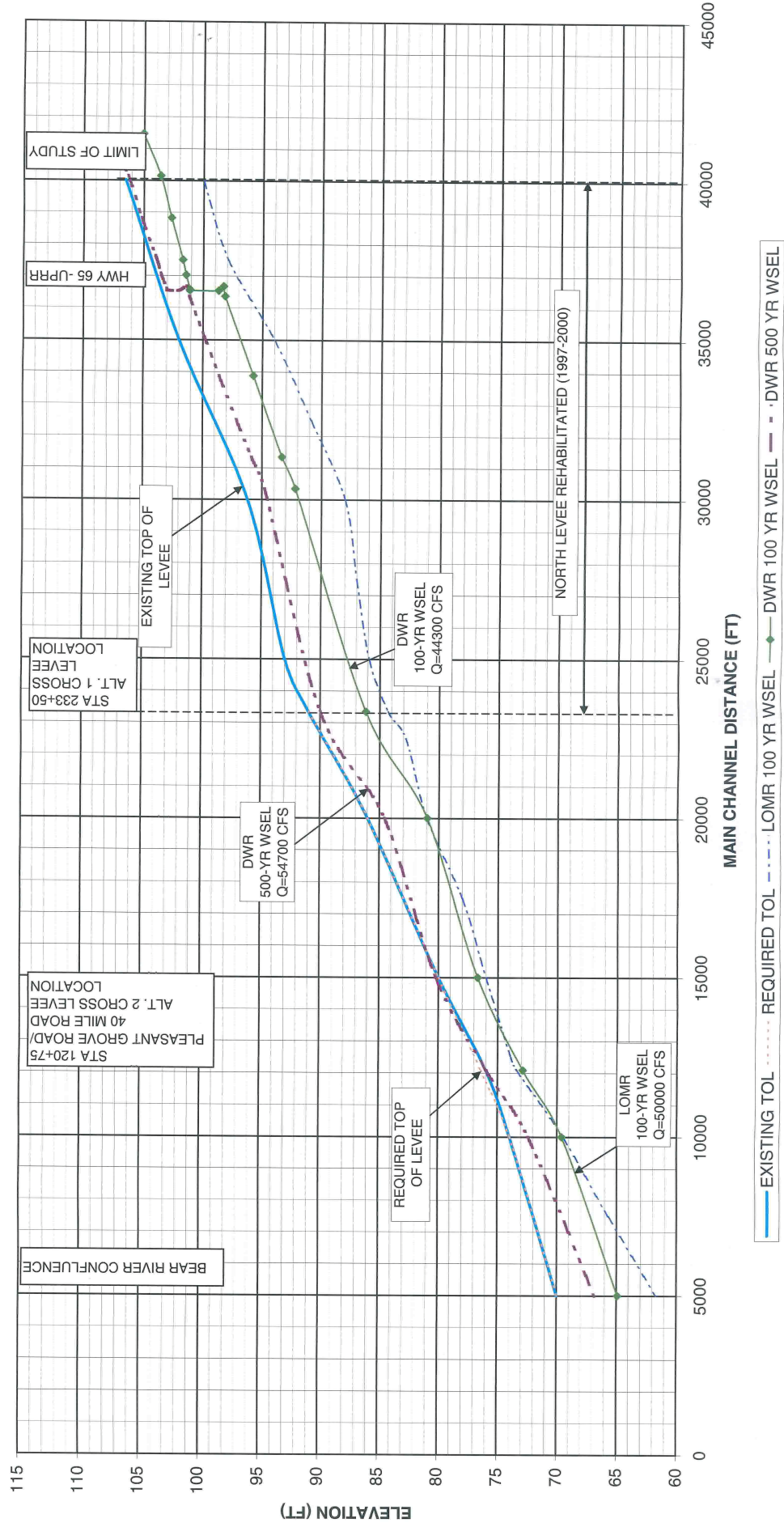
**The City of Wheatland
September 17, 2005
Wheatland General Plan Update - Exterior Drainage
PROTECTED ACREAGE**

Item	Existing Conditions (Acres)		Alt. No. 1 (Acres)	Alt. No. 2 (Acres)	Alt. No. 3 (Acres)	Local Levees (Acres)
Flooding > 3'	2390		1700	267	0	0
Flooding 1' to 3'	191		191	0	0	0
Floodplain	467		0	0	0	198
Floodplain	209		0	0	0	16
Floodway	589		0	0	0	0
Total Acres Flooded	3846		1891	267	0	N/A
Acres Protected	N/A		1955	3579	3846	214
Alternative Cost	Low	N/A	\$ 8,490,000	\$ 14,791,250	\$ 30,811,250	\$ 1,785,000
	High		\$20,743,806	\$34,980,434	\$54,284,910	\$2,678,000
Per Acre Cost	Low	N/A	\$ 4,343	\$4,133	\$8,011	\$8,341
	High		\$10,611	\$9,774	\$14,115	\$12,514

Appendix B

Profiles – Bear River and Dry Creek

BEAR RIVER ABOVE DRY CREEK NORTH LEVEE



DRY CREEK ABOVE BEAR RIVER SOUTH LEVEE

